

**OBJECTION UNDER 37 C.F.R. § 1.75**

Claim 16-18 have been objected to under 37 C.F.R. 1.75 as being substantial duplicates of claims 12-13 and 15. The Examiner states that the recitation of intended use doesn't result in a structural difference and the preamble is generally not accorded any patentable weight where it merely recites the purpose or intended use of a structure. Applicants would direct the Examiner's attention to the penultimate line of claim 16 which indicates that the absorption data is transmitted by a fiber optic cable. This limitation is not found in any of claims 12-13 or 15. Thus, claims 16-18 differ structurally from the preceding system claims and are therefore, not substantial duplicates of claims 12-13 and 15 under 37 C.F.R. § 1.75. Allowance of both sets of claims, i.e., claims 12-13 and 15, as well as 16-18, is respectfully requested.

**REJECTION UNDER 35 U.S.C. § 112**

Claims 1-10 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Examiner has objected to claims 1 and 8-10 regarding antecedent basis for certain measured concentration language. Claims 1, 8, 9, and 10 have all been amended to assure proper antecedent basis for the individual chemical concentrations and/or specific recitations of sodium hydroxide, sodium sulfide, and sodium carbonate as used in the claim preambles. In view of these amendments, withdrawal of this rejection is respectfully requested.

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**REJECTION UNDER 35 U.S.C. § 102(b) OVER DANIELSSON**

Claims 1-2, 4-7, 11-13 and 16-17 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Danielsson. The Examiner states that the Danielsson paper discusses UV-VIS spectroscopic measurements in opaque solutions, i.e., process liquors in the paper/pulp industries. The Examiner characterizes Danielsson as discussing the use of, or attempted use of, attenuated total reflection probes for measurements in process liquors of kraft pulp and paper. The Examiner alleges that Danielsson describes the use of ATR in white liquor with measurement of sulfides and polysulfides as the only species having appreciable absorption. The Examiner states that the use of synthetic solutions has allowed calibration models to be constructed for sulfides, lignin and total solute content. Thus, the Examiner concludes that "[B]efore long-time use of the probe in highly alkaline media can be recommended, a protection for the end mirror must be included." Nonetheless, the Examiner concludes that the presently claimed invention is anticipated.

The present invention is distinguished from Danielsson since the components in the kraft liquor process which the present invention measures are sodium hydroxide, sodium carbonate and sodium sulfide. Danielsson uses a UV light having a wavelength longer than 210 nm. Danielson is incapable of providing absorption for any substance below 210 nm. As specifically noted by the Examiner, Danielsson only determined the concentration of sulfide and polysulfide in synthetic pulping process white and black liquors. Danielsson neither implies nor indicates that the concentrations of hydroxide

and carbonate could be determined using a UV light source at a wavelength below 210 nm. Danielsson does not recognize that hydroxide and carbonate in pulping process liquors, have significant absorptions (in terms of process analysis) in the short UV wavelength range below 210 nm. Furthermore, Danielsson does not teach or suggest that hydroxide and carbonate can be treated as non-absorbing substances that may affect the refractive index in the liquor so that their concentrations in the liquor can be determined through multi-variate calibration in data reduction. Danielsson merely indicates that it may be possible to determine total salt in the liquor using multi-variate calibration. For all these reasons, Danielsson does not anticipate or render obvious the invention as currently claimed.

**REJECTION UNDER 35 U.S.C. § 102(b) OVER BYSOUTH**

Claims 1, 4, 6, and 11 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Bysouth. According to the Examiner, the Bysouth reference teaches flow injection gradient dilution for obtaining UV spectra of concentrated solutions. Bysouth allegedly relates to a method and apparatus for precise dilution of concentrated samples enabling their spectra to be obtained. The spectra thus obtained, may then be used for calculation of the aromatic hydrocarbon content in the concentrated samples. According to the Examiner, Bysouth comprises an arrangement of computer-controlled pumps, an injection valve, a mixing chamber, a flow cell, and a scanning spectrophotometer in the wavelength of 190 to 375 nm. According to the Examiner, Bysouth requires no calibration/characterization for single species measurement since

multi-parameters (absorbance in many wavelengths) are monitor or conversely can be used to obtain spectra of highly concentrated samples. Thus, Bysouth is alleged to determine multiple species through this system. This rejection is respectfully traversed.

The present invention uses an ATR cell to achieve optical dilution, without physical dilution, of the sample for analysis of concentrated liquors at any wavelength range. Bysouth, by contrast, discloses a device which is a flow injection system that achieves physical dilution of the concentrated solutions without diluting the solution in the preparation process, i.e., Bysouth directly injects concentrated solution into a device which is diluted by a computer control system in the mixing chamber. The actual spectra at any wavelength are collected by Bysouth from the diluted solution. The dilution factor is needed during the data reduction to determine the final concentration. Thus, Bysouth neither teaches nor suggests the invention as presently claimed which is the optical dilution, without physical dilution, of a sample, and determination of individual chemical concentrations by regression. The present invention, unlike Bysouth, makes it possible for the probe to be placed directly into a kraft liquor stream and for appropriate data to be developed. Since Bysouth neither teaches nor suggests the invention as presently claimed, withdrawal of this rejection is respectfully requested.

**REJECTION UNDER 35 U.S.C. § 103 OVER DANIELSSON AND DOYLE**

Claims 3, 14-15, and 18 have been rejected under 35 U.S.C. § 103 as being unpatentable over Danielsson as applied to claims 1, 11, and 16 above and further in

view of Doyle. The Examiner states that the Doyle article discusses the analysis of strong absorbent chromophores by UV/Visible ATR spectroscopy. The Examiner concludes that it would have been obvious to one of ordinary skill in the art the time the invention was made to replace the ATR element configuration of Danielsson with the tunnel flow system cell of Doyle to arrive at the presently claimed invention. This rejection is respectfully traversed.

Doyle, like Danielsson, neither teaches nor suggests that the concentration of hydroxide and carbonate could be determined using a UV light source at a wavelength below 210 nm. Doyle, does not remedy any of the deficiencies of Danielsson. Doyle, like Danielsson, does not recognize that hydroxide or carbonate in a pulping process will have any significant absorption below 210 nm. Thus, even if Danielsson and Doyle were combined as suggested by the Examiner, the invention as presently claimed, would not result. Withdrawal of this rejection is respectfully requested.

**REJECTION UNDER 35 U.S.C. § 103(a) OVER DANIELSSON, HOLMQVIST AND SALOMON**

Claims 8-10 have been rejected under 35 U.S.C. § 102(a) as being unpatentable over Danielsson as applied to claim 7 above, and further in view of Holmqvist and Salomon. Holmqvist has been added for teaching a method of determining the degree of reduction of sulfate liquor or smelt solution using a combination of UV and IR spectroscopy. Salomon has been added for disclosing ion monitoring of kraft process liquors by capillary electrophoresis. The Examiner concludes that it would have been

obvious to one of ordinary skill at the time the invention was made to include carbonate and hydroxide into the determination of Danielsson because they are shown by Salomon. Further, the Examiner concludes that carbonate and hydroxide are inorganic ions that are important to the solutions which make up the kraft process and because one of ordinary skill in the art would recognize (due to the differences in absorption behavior), at the wavelengths taught by Salomon, that it would be possible to determine the carbonate and hydroxide components. This rejection is respectfully traversed.

The works of Holmqvist and Salomon do not remedy the deficiencies discussed above regarding to the works of Danielsson. Holmqvist discloses conventional UV absorption measurements to 200 nm for sulfide and polysulfide determination. Although it measures absorption at 200 nm, it did not and cannot measure carbonate. Regarding the use of UV by Holmqvist, the system and techniques taught by Holmqvist are actually not as advanced as the work of Danielsson. It is certainly not a remedy to deficiencies of the Danielsson work.

The work of Salomon relates to electrophoresis techniques using UV wavelength detection, which is a completely different technique from the spectrophotographic technique that is presently claimed. Thus, even if Salomon and Holmqvist were added to Danielsson, the present invention would not result. Withdrawal of this rejection is respectfully requested.

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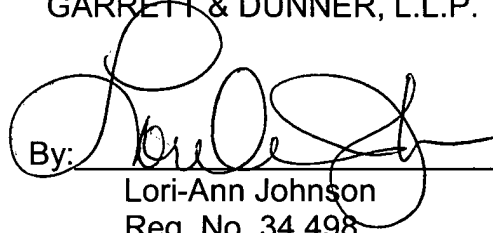
**CONCLUSION**

Applicants respectfully requests reconsideration and the continued examination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

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By:   
Lori-Ann Johnson  
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Dated: February 4, 2002

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**APPENDIX TO AMENDMENT OF February 3, 2002  
Version with Markings to Show Changes Made**

**AMENDMENTS TO THE SPECIFICATION**

This invention was made with Government support under Contract No. DE-FC07-96ID13438 awarded by the Department of Energy. The government has certain rights in this invention.

**AMENDMENTS TO THE CLAIMS**

1. A method for simultaneously determining multiple individual chemical concentrations of a liquid stream comprising:
  - subjecting at least a segment of the stream to ultraviolet light where the light penetrates a short distance into the segment and the effective path length of the light is a function of the refractive index of the segment;
  - generating an ultraviolet absorption spectrum from said ultraviolet penetration of the sample over a wavelength from 190 to 300 nm; and
  - analyzing the ultraviolet absorption spectrum by a regression method to determine the [component] individual chemical concentrations of the liquid stream.

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8. A method according to claim 7 wherein the measured [component] individual chemical concentrations of the kraft liquor are selected from sodium hydroxide, sodium sulfide, and sodium carbonate.

9. A method for simultaneously determining the sodium hydroxide, sodium sulfide, and sodium carbonate concentrations of a kraft liquor stream comprising:  
generating an ATR UV absorbency spectrum of the liquor over a wavelength from 190 to 300 nm, analyzing the ultraviolet absorption spectrum by a regression method to determine the [component] concentrations of sodium hydroxide, sodium sulfide, and sodium carbonate in [of] the liquor.

10. A method according to claim 9, further comprising controlling operation of a kraft cooking digester, recausticizing unit, white liquor oxidation reactor or chemical recovery furnace in response to the determined [chemical] sodium hydroxide, sodium sulfide, and sodium carbonate concentrations.



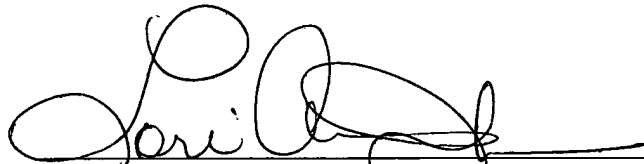
Attorney Docket No. 7648.0002  
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Case 1743/\$

**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8**

I hereby certify that this correspondence is being deposited with the United States Postal Services under 37 C.F.R. § 1.8 on the date indicated below and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

on February 4, 2002  
Date

  
Lori-Anne Johnson

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**Enclosure:**

1. Amendment - 12 pages
2. Petition for Extension of Time - 1 page
3. Postcard